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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/697,186	10/30/2003	Alex Melament	IL920030038US1	8171
7590	05/12/2006		EXAMINER	
Stephen C. Kaufman Intellectual Property Law Dept. IBM Corporation P. O. Box 218 Yorktown Heights, NY 10598			CAMPOS, YAIMA	
			ART UNIT	PAPER NUMBER
			2185	
DATE MAILED: 05/12/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>
	10/697,186	MELAMENT ET AL.
	<b>Examiner</b>	<b>Art Unit</b>
	Yaima Campos	2185

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 13 March 2004.
- 2a) This action is FINAL.                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-14 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) All
  - b) Some \*
  - c) None of:
    1. Certified copies of the priority documents have been received.
    2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413)
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mail Date. _____
3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.	5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)
	6) <input type="checkbox"/> Other: _____.

**DETAILED ACTION**

1. The examiner acknowledges the applicant's submission of the amendment dated March 13, 2006. At this point claim 4 has been amended and no claims have been cancelled. Thus, 14 claims; 4 independent claims and 10 dependent claims are pending in the instant application.

**I. OBJECTIONS TO THE SPECIFICATION*****Claim Objections***

Claim 4 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 4 appears to duplicate the contents of claim 1, the claim on which it depends as claim 1 recites "after said backing up, copying at least some of said data" and claim 4 recites "copying is performed immediately after said backing up." The word immediately does not appear add any limitations to claim 4 as it is not clear to the examiner the time frame it encompasses; therefore, copying data after backing up and copying data immediately after backing up is interpreted as the same limitation.

**II. REJECTIONS NOT BASED ON PRIOR ART*****Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As per claim 4, claim 4 recites the limitation “copying is performed immediately after said backing up” in lines 1-2. The word “immediately” renders the claim vague and indefinite as it is not clear the time frame that the word “immediately” encompasses. The examiner interprets this claim to read -- **transferring is performed after said backing up** -- and has been treated as such for the rest of this office action.

### **III. REJECTIONS BASED ON PRIOR ART**

#### **Claim Rejections - 35 USC § 102**

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 4, 6-8 and 10-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Jacobson et al. (US 5,696,934).

4. As per claims 1, 4, 6 and 13-14

“A method of storage management, the method comprising:” as [**“methods for utilizing storage disks of differing capacity in a single storage volume in such systems”**  
**(Column 1, lines 14-16)**]

“storing data on a high reliability high performance storage medium;” [**With respect to this limitation, Jacobson discloses that “data storage system 10 places the more critical data in the mirror RAID areas since this affords the highest performance and reliability”** (Column 6, lines 63-65) as mirror RAID areas use RAID level 1

which provide a one-to-one data protection (Column 5, lines 25-39). Please see

**mirror RAID areas 18 (Figure 1)]**

“backing up said data on a high reliability low performance storage medium;” [Jacobson discloses “RAID management system 16 manages the two different types of RAID areas in the disk array as a memory hierarchy with the mirror RAID areas acting similar to a cache for the parity RAID areas” (Column 6, lines 51-54 and Figure 1)

wherein “data storage system 10 manages the migration of data between mirror and parity storage schemes” (Column 6, lines 48-50) and explains that “parity storage is less expensive than mirror storage, but is also less reliable and has a lower performance” (Column 6, lines 31-32) as parity RAID areas use RAID level 5 in which original data is stored in 5 disks and only one disk is used for redundant data (Columns 5-6, lines 65-67 and 1-3)]

“and after said backing up, copying at least some of said data from said high reliability high performance storage medium to a low reliability high performance storage medium and freeing space occupied thereby on the high reliability high performance storage medium” [With respect to this limitation, Jacobson discloses “map storage 21” which is implemented using NVRAMs (non-volatile RAMs) and explains that “as the RAID management system dynamically alters the RAID level mappings, it also update the mapping information in memory map store 21 to reflect the alterations” (Column 8, lines 25-28); therefore, data is copied to “map storage 21” after it is moved from one RAID system to another (mirror and parity RAID systems); when data is moved from a source RAID system to a destination RAID system, an empty space is created in the source RAID system. Note that “map storage 21” comprises

a “low reliability high performance storage medium” as compared with the other memories used in “data storage system” as it is implemented in a non-volatile RAM, which is typically a high performance memory, but less reliable than a RAID].

Jacobson also explains that [“RAID management system 16 provides a data manager means for controlling disk storage and reliability levels, and for transferring data among various reliability storage levels. These reliability storage levels are preferably mirror or parity redundancy levels as described below, but can also include a reliability storage level with no redundancy at all” (Column 4, lines 16-25)].

5. As per claims 7 and 8, Jacobson discloses “The system of claim 6,” [See rejection to claim 6 above] “further comprising: a storage policy sub-unit configured to determine when to backup data on said low performance high reliability storage medium” and “when to transfer data from said high performance high reliability storage medium to said high performance low reliability storage medium” [Jacobson discloses this concept at it is disclosed that “RAID management 16 shifts, organizes, and otherwise manages the data between the mirror and parity RAID areas in accordance with a defined performance protocol” wherein “more critical data” is placed “in the mirror RAID areas” (Column 6, lines 57-67) and explains that the migration policies of “access frequency” or “access recency” are used to transfer data between mirror RAID and parity RAID].

6. As per claim 10, Jacobson discloses “The system of claim 6,” [See rejection to claim 6 above] but does not disclose expressly that “said high reliability high performance storage medium is configured to have a mean time between failure which is

at least ten times higher than a mean time between failure which said low reliability high performance storage medium is configured to have” [With respect to this limitation, Jacobson discloses that “disk array 11” is implemented using different levels or RAID for different desired reliability levels; mirror RAID for higher reliability and parity RAID for lower reliability and discloses “map storage 21” which is implemented using NVRAM (Figure 1). RAID storage has a mean time between failures which is much higher than the mean time between failures of NVRAM as mirror RAID storage is able to detect failures within a disk array and recover data as a one-to-one protection of every bit of data is available striped in different disks of the array (Column 5, lines 25-38)].

7. As per claim 11, “The system of claim 6,” [See rejection to claim 6 above] “wherein said high reliability high performance storage medium is configured to allow at least ten times as many random read/write/rewrite operations per unit of time as said high reliability low performance storage medium is configured to allow” [Jacobson discloses this concept as host computer access to “data memory system 10” is done through “I/O interface bust 17” which communicates with virtual storage for data access in “map storage 21” which is stored on “NVRAM (non-volatile random access memory)” (Column 4, lines 11-25 and Figure 1) and is used to present a virtual view of the data to a host accessing “storage array 11” (Column 3, lines 61-63). Data in the NVRAMs can be accessed at faster rates than data stored in a disk array; therefore, “data memory system 10” can be accessed at much faster rates than “disk array 11”].

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8. As per claim 12, Jacobson discloses “The system of claim 6,” [See rejection to claim 6 above] “further comprising: a third level of storage comprising at least one low performance high reliability storage media disconnected from said high performance high reliability medium” [With respect to this limitation, Jacobson discloses that “The storage disks can be independently connected or disconnected to mechanical bays that provide interfacing with SCSI bus 13. Disk array controller 14 recognizes storage disks 12 regardless into which bay they are plugged” (Column 5, lines 20-24)].

9. Claims 1, 4, 6 and 13-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Craig (US 5,790,176).

10. As per claims 1, 4, 6 and 13-14

“A method of storage management, the method comprising:” as [See storage system in Figure 5 which is used to store video data]

“storing data on a high reliability high performance storage medium;” [With respect to this limitation, Craig discloses “Magnetic disk drives 521-52N” as a third type of memory device and explains that data may be “repeated in a plurality of memory device by transmitting the same segment from memory device 511 to memory devices 521, 522 and 523 via data streams 11(a), 11(b) and 11(c)” (Column 17, lines 44-47). Note that magnetic disk drives comprises an array of disks; therefore, it has higher performance and reliability than backup storage or cache]

“backing up said data on a high reliability low performance storage medium;” [With respect to this limitation, Craig discloses “Archival Tapes 511-50N” as a first type of memory device and “High Speed Tapes 511-51N” as a second type of memory

**device and explains that “the first type of memory device can be considered an archival or slow speed tape while the second type of memory device can be constituted by high speed tape drives” (Column 17, lines 29-31 and Figure 5). Note that this backup storage system comprises high reliability as it is duplicated in archival tapes 501-50N and 511-51N, but has low performance as tape storage is slower than magnetic disk storage and cache]**

“and after said backing up, copying at least some of said data from said high reliability high performance storage medium to a low reliability high performance storage medium and freeing space occupied thereby on the high reliability high performance storage medium” [With respect to this limitation, Craig discloses “DRAMs 531-53N” as a fourth type of memory device which are used as cache memory and explains that “the contents of the third type of memory device represented by 521...52N, can be fed directly into corresponding memory devices of the fourth type” and then be provided to a system operator thru outputs 551-55N (Column 17, lines 62-67 and Column 18, lines 1-10 and Figure 5). The data is initially stored/backed up in storage systems 501-50N and 511-51N, when a user wants to retrieve this data, the system will try to retrieve from cache, and if the data is not in cache, it will retrieve this data from magnetic disk drives and store it in cache based on different criteria of usage by system subscribers (Column 18, lines 14-17); therefore, the data is sent to cache after it has been backed up. Note that cache is implemented in DRAM, which provide high performance as DRAM is used for fast temporary access to data, but provides less reliability as cache (DRAM) may lose data when the storage system loses power].

**Claim Rejections - 35 USC § 103**

The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

11. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jacobson et al. (US 5,696,934) in view of Mizrachi et al. (US 2003/0033486).
12. As per claims 2 and 3, Jacobson discloses “the method of claim 1,” [See rejection to claim 1 above], but fails to disclose expressly that “data is classified according to characteristics thereof and is backed up at a rate that is dependent on the respective characteristics of said data” wherein “said data is backed up at a rate dependent on at least one from a group including at least: an occupancy level of said high reliability high performance storage, availability of back-up media and access to said high reliability low performance storage medium.”

Mizrachi teaches a memory management method/system wherein “data is classified according to characteristics thereof and is backed up at a rate that is dependent on the respective characteristics of said data” wherein “said data is backed up at a rate dependent on at least one from a group including at least: an occupancy level of said high

reliability high performance storage, availability of back-up media and access to said high reliability low performance storage medium.” Mizrachi discloses this concept as [**a method and apparatus for using estimated communication rates in a cache replacement algorithm**” (Column 2, paragraph 0017, lines 2-4), teaches that “**a rate estimator, coupled to the mapper, dynamically determines relative rates of active connections. The rates are used to classify the connections as fast or slow**” (Column 2, paragraph 0018, lines 13-16) and also discloses that “**partitioning the cache memory includes partitioning the cache memory into first and second areas of the cache memory**” (Column 3, paragraph 0073) and specifies the existence of “**first and second cache memories, coupled to receive and hold context information from an external memory with respect to a plurality of tasks, each task activated by one or more activating events, so that the context information is available for access by a processor in performing the tasks**” (Column 3, paragraph 0029)].

Jacobson et al. (US 5,696,934) by Mizrachi et al. are analogous art because they are from the same field of endeavor of computer memory management.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the storage system which includes different reliability and performance levels for data storage as taught by Jacobson further classify and migrate data based on transfer rate information as taught by Mizrachi.

The motivation for doing so would have been because Mizrachi teaches that [**“using a partitioned cache architecture based on rate estimation minimizes slow external memory accesses by assuring that context information for faster connection resides in fast internal memory**” (Column 3, paragraph 0024)].

Therefore, it would have been obvious to combine Mizrachi et al. (US 2003/0033486) with Jacobson et al. (US 5,696,934) for the benefit of creating a memory management system/method to obtain the invention as specified in claims 2-3.

13. **Claims 5 and 9** are rejected under 35 U.S.C. 103(a) as being unpatentable over Jacobson et al. (US 5,696,934).

14. As per **claim 5**, Jacobson discloses “The method of claim 1,” but does not disclose expressly that “said data include medical images.”

At the time of the invention it would have been obvious to a person of ordinary skill in the art to “include medical images” in the type of data stored in the data storage system as described by Jacobson because Jacobson discloses [**a data storage system 10** wherein **“disk arrays accommodate additional storage disks of different capacity and utilize their entire capacity;”** (Column 2, lines 29-31) and explains that the system “affords maximum flexibility and adaptation” as “**the RAID management system 16 effectively tunes the storage resources of a data storage system according to the application or user requirements**” (Column 7, lines 12-25) therefore, the storage system as described by Jacobson may be used to store any kind of data, even when this data comprises very large amounts of data or data that requires very high reliability].

15. As per **claim 9**, Jacobson discloses “The system of claim 6,” [See rejection to **claim 6 above**] but does not disclose expressly that “said high performance low reliability storage medium is higher volume than said high performance high reliability storage medium.”

16. At the time of the invention it would have been obvious to one of ordinary skill in the art to have “high performance low reliability storage medium is higher volume than said high performance high reliability storage medium” because **[Jacobson discloses the concept of having one storage medium with less reliability or performance requirements be of larger size than a storage medium of higher reliability or performance requirements to incur less storage system cost as “RAID management system 16 effectively tunes the storage resources of a data storage system according to the application or user requirements” wherein “in an application where cost is premium and less importance is placed on performance or reliability, the RAID management system may establish a proportionally larger parity RAID area in comparison to the mirror RAID area” (Column 7, lines 12-25)].**

#### **IV. CITATION OF RELEVANT ART**

17. The following prior art made of record and not relied upon is cited to establish the level of skill in the applicant's art and those arts considered reasonably pertinent to applicant's disclosure.

18. The following reference teaches data migration in a system having different levels of RAID as the one described by Jacobson et al. (US 5,696,934).

#### **U.S. PATENT NUMBER**

US 5,392,244

**V. CLOSING COMMENTS**

**Conclusion**

**a. STATUS OF CLAIMS IN THE APPLICATION**

The following is a summary of the treatment and status of all claims in the application as recommended by M.P.E.P. § 707.07(i):

**a(1) CLAIMS REJECTED IN THE APPLICATION**

Per the instant office action, claims 1-14 have received a second action on the merits and are subject of a second action non-final.

For at least the above reasons it is the examiner's position that the applicant's claims are not in condition for allowance.

**VI. DIRECTIONS OF FUTURE CORRESPONDENCE**

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yaima Campos whose telephone number is (571) 272-1232 and email address is [Yaima.Campos@uspto.gov](mailto:Yaima.Campos@uspto.gov). The examiner can normally be reached on Monday to Friday 8:30 AM to 5:00 PM.

**IMPORTANT NOTE**

20. If attempts to reach the above noted Examiner by telephone or email are unsuccessful, the Examiner's supervisor, Mr. Donald Sparks, can be reached at the following telephone number: Area Code (571) 272-4201.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

May 3, 2006

Yaima Campos  
Examiner  
Art Unit 2185



DONALD SPARKS  
SUPERVISORY PATENT EXAMINER